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THE ENGINEERING IN AGRICULTURE NEWSLETTER

WINTER 1995

Engineering Services and R.A.S. Engineering Staff Combine Efforts

Rick Atkins, Branch Head, Engineering Services Branch

Staff from Engineering Services and Regional Advisory Services have organized their function into three teams. The purpose of the new arrangement is to focus engineering resources and programs on the goals defined in the business plan of Alberta Agriculture, Food and Rural Development. The teams will focus on the areas of:

- Agricultural resource management.
- Crop systems.
- Livestock systems.

Engineering goals will be aligned with priority needs of the industry, and work toward a coordinated Engineering program for the province. Activities will include research, information development, and assistance to the industry in adopting new technology and systems.

The Alberta Farm Machinery Research Centre (AFMRC) and a Program Support team will be an integral part of these teams in project planning and implementation. AFMRC's concentration of engineers and technologists, facilities and equipment, make it a powerful resource for conducting research and development projects.

Industry involvement is an essential part of the Engineering program development. Industry diversification and market competitiveness are important issues being addressed through:

- Alternative crops research and product development.
- Value added and secondary processing in both crops and livestock.
- Environmental impacts and assessments.
- Water quality and supplies.
- Expansion of intensive livestock operations.
- Land use issues and conservation of soil and water resources under various cropping systems.

An objective of the organization is to make the services of engineering better known to the industry and to the staffs of various organizations. To that end the Alberta Farm Machinery Research Centre (AFMRC) has taken action to create a "new look". It assembled a marketing team to develop a business plan for working with clients. The plan includes client contacts, responsiveness to needs of the industry, and new ways of doing business in the future.

Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT
Engineering Services

Printed on Recycled Paper

The purpose of this newsletter is to advise of activities and projects being conducted by Alberta Agriculture, Food and Rural Development's Engineering Services and Regional Agricultural Engineering staff. For further information on these projects and other engineering related activities contact:

Lethbridge	381-5112	Airdrie	948-8537
Red Deer	340-5322	Vermilion	853-8224
Barrhead	674-8253	Fairview	835-2291
Edmonton (Eng. Services)	427-2181	Lethbridge (AFMRC)	329-1212

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Where Does the Rain Go?

Brian Kennedy, Regional Engineer, Vermilion

Apparently, not all of the rainfall in a cattle feedlot runs away. Researchers and a Vegreville area cattle feedlot have teamed up to measure the amount and the quality of water running off the feedlot surface. The CAESA funded study used the modern 18,000 head feedlot of Highland Feeders. The facility is designed to take advantage of natural south slopes and has sloping surfaces of 2.5 percent directing drainage to a holding pond.

After a rainfall, only a range of 15 to 40 percent of the total water runs off the large pens into the holding area. The runoff volume was measured with a V-notch weir and samples of the water were collected for chemical and microbiological analysis. Where did the rest of the water go? Since the water cannot infiltrate through an impermeable layer under the manure pack, it is assumed that the water has been absorbed by the manure itself and stored in the depressions of cattle hoofprints. Most of this water will evaporate.

Although more study is needed, the information will help engineers to design the proper size of holding ponds to collect the runoff from more serious storms and prevent contamination of surrounding areas.

Using Diphoterine with Nitrogen Fertilizers

Rob Maze, Project Engineer, AFMRC, Lethbridge

Engineers are trying to determine if a new chemical to North America, called Diphoterine, can eliminate seed damage caused by nitrogen fertilizers. In continuation with the Centre's work regarding anhydrous ammonia use at seeding, engineers are looking at using Diphoterine as an additive to anhydrous ammonia fertilizer to allow for placement of the fertilizer with the seed.

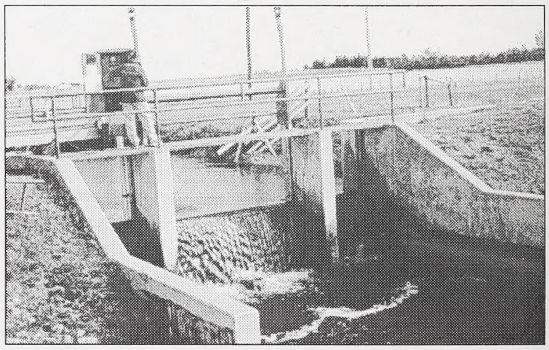
The project has a number of benefits since the only option farmers presently have is to "double shoot" or apply fertilizer prior to direct seeding. Double shooting uses two separate tubes to apply seed and fertilizer. Soil acts as a buffer between the seed and the toxic effects of the anhydrous ammonia. Allowing higher rates of nitrogen fertilizer to be placed with the seed opens the door to single disk systems. This could lead to reduced soil disturbance, lower moisture loss and minimal annual weed growth.

The Centre has been working closely with DH Marketing and Consulting of Tarrytown, New York, who have the North American rights to the chemical. DH markets the product as a chemical burn agent for acids and bases, but is also interested in other applications for the product. It is produced in France at Prevor Laboratories. Agriculture Canada and Montana State University have also assisted in the project.

Langemann Gate

John Kienholz, Mechanical Engineering Technologist, Edmonton

The Langemann Gate, developed by Aqua Systems 2000 Inc. of Lethbridge, is a new automated control gate which accurately regulates water in irrigation canals. This folding overshot gate is equipped with an electronically controlled drive mechanism. An electronic water level sensor sends a signal to the control system which in turn activates the drive mechanism. It was designed for easy installation as a retrofit in water control structures which utilize stoplogs. Flow restriction is minimal and calibration is simple. The system can be configured to maintain either the level or flow in the canal. "Wet installation" is easily accomplished.



Engineering Services was contracted to design the drive. The system is driven by a 12 VDC solar powered reversible gear motor. Power is transmitted from the motor through a drive line which raises and lowers control poles attached to each side of the gate. The drive is supported by two channels located in the stoplog gaps on each side of the control structure.

Two units have been installed in the Lethbridge area. Response has been favourable from personnel managing the canals who estimate a time saving of 50 minutes per day per structure setting the gates. The prospects for exporting these units are excellent.

Storing & Handling Fuel on the Farm

John Chang, Energy Engineer, Edmonton

Thanks to a partnership with the United Farmers of Alberta Cooperative Limited (UFA), the booklet "Storing and Handling Fuel on the Farm" has recently been published. Alberta farms have an estimated fuel storage capacity of at least 250 million litres and use more than 800 million litres of farm fuel (gasoline and diesel) annually. As a result, the environmental risks and financial liability for farmers are significant. Farmers are not exempt from the Alberta Environmental Protection and Enhancement Act, the legislation that supports and promotes the protection, enhancement and wise use of the environment. However, prosecution under this act may be avoided if "due diligence" - taking all reasonable steps to prevent the commission of an offense - can be shown. Banks and other lending agencies often require the completion of an environmental assessment questionnaire, including specific questions about fuel storage, when processing a loan application. Insurance companies also ask similar questions in order to assess the risk level associated with issuing insurance.

The information contained in this booklet includes:

- a comparison of on-farm storage options
- how to reduce risks due to fire, leakage, spillage, theft and other factors
- tank installation
- emergency procedures in case of fire, leaks or spills.

AFMRC Acquires Plot Combine

Lawrence Papworth, Project Engineer, AFMRC, Lethbridge

A used plot combine was recently purchased to harvest research plots. This combine is outfitted with a HarvestData System and GrainGage package which automatically weighs the grain yield and measures its seed moisture.

The GrainGage package consists of three chambers and works as a batch system. Seed is delivered by a hopper into the top chamber where a level detector senses when the constant volume chamber is full. An air operated slide gate closes and the moisture is measured. The seed is then dropped into the next chamber where the weight is measured. As many samples as needed are measured through until the plot is completed. The computer automatically totals the weights and averages the moisture samples. The maximum flow through the GrainGage is 145 bu/hr.

The main advantage of the HarvestData System and GrainGage package is the time and labour saved while harvesting as the seed does not have to be bagged and analyzed in the laboratory.

Fencing Costs

Dennis Darby, Farm Structures Specialist, Lethbridge

The "Big Flood" of 1995 in the southern foothills resulted in a lot of damage to corrals and fences. Disaster adjusters were busy tallying up the costs. At the same time, engineers were revising feedlot design information.

(continued)

To assist in the rapid collection of cost data, a spreadsheet computer program was developed to quickly price the materials for any length and style of fence. Typically, they consist of 2 x 6 rail fences for feedlots, slatted board windbreak fences and various wire pasture fencing. An cost comparison is provided in the table below.

Fence Description	Post Data			Cost per Foot ($)
	Spacing (ft.)	Diameter (in.)	Length (ft.)	
8 ft. slab fence (25% porosity)	8	6	10	5.57
8 ft. slatted board (25% porosity)	8	6	10	6.62
8 ft. solid board (0% porosity)	8	6	10	7.67
10 ft. slatted board (25% porosity)	8	6	12	7.91
2 x 6, 4 rail	8	6	8	3.3
Barb wire, 4 - wire	16	4	7	0.52
High tensile, 5 - wire	16	4	7	0.35
High tensile, 5 - wire	50	4	7	0.21

Material prices used are as follows:
Lumber - $550.00/MBF
Barbed wire - $42.00 per 1320 ft. roll
High-tensile wire - $72.00 per 3750 ft. roll
Note: 10% was added to the wire fence cost for end braces, 20% added for high-tensile fences for intermediate stays and stronger end brace assemblies.

Soil Crusting

Rob Maze, Project Engineer, AFMRC, Lethbridge

In cooperation with Bourgault Industries, a review of soil crusting in Western Canada has recently been completed. Bourgault contracted AFMRC to outline the causes, effects and solutions of the problem for use in their farm equipment owner's manuals.

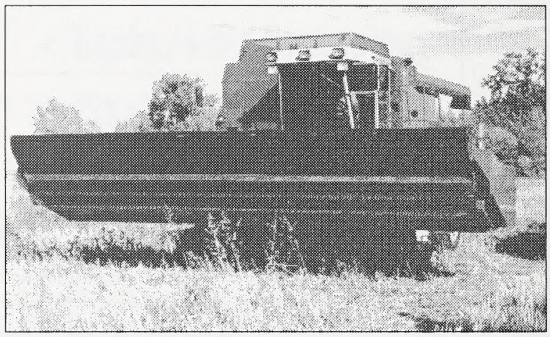
The report emphasises farmer education and how to manage the problem. The review includes information on how crusts are formed, their effect on crops, information on soils prone to crusting, preventative maintenance and the costs of solutions.

Solid Seeded Bean Harvesting Continues

Robert Maze, Project Engineer, AFMRC, Lethbridge

Work has continued on the harvesting of solid seeded beans with conventional cereal grain equipment. A Western Combine Corporation stripper header, mounted on a Massey Ferguson 8570 combine, and a Keho Air Reel on a Case 960 test combine were evaluated for their ability to pick up solid seeded beans in an unrolled field.

The solid seeded Othello bean crop yielded 2500 lbs/ac. Preliminary results showed that with minor design changes the stripper header could be used to harvest the bean crop. While loss measurements with the stripper header were high at 23 percent, the stripper finger length and skid plate attachments did not allow the fingers to reach the bottom pods. Changes to finger length or skid plates would further reduce losses. In parts of the field where the fingers were able to reach the bottom pods, losses were negligible.



The Keho Air Reel, mounted on a straight cut header, performed well. In ideal conditions, total loss from the system was 12 percent. A detailed loss evaluation will take place in 1996 after improvements have been made to the units.

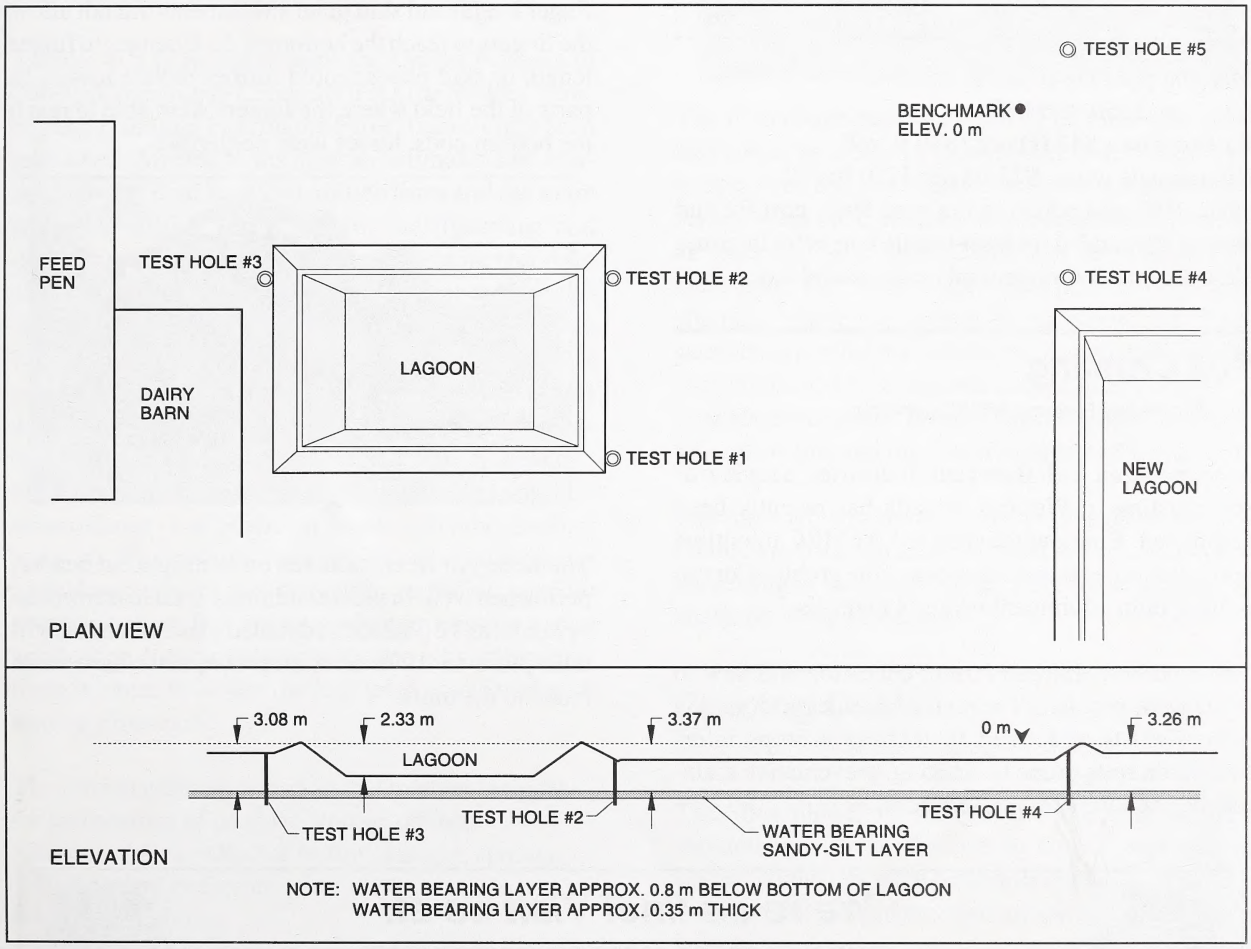
Testing for Leachate from a Dairy Lagoon

Wayne Winchell, Regional Engineer, Barrhead

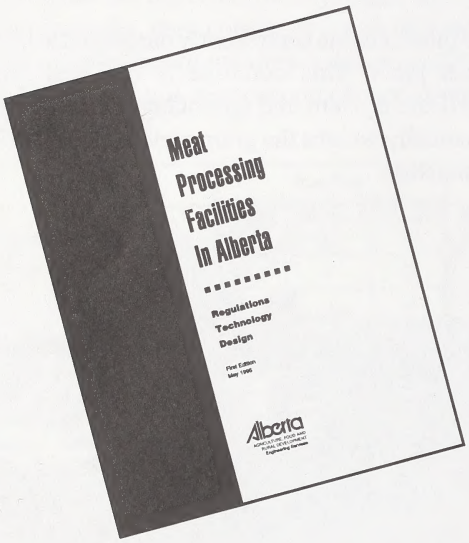
A dairy producer in the Westlock area was concerned that his manure lagoon, built 12 years ago, may be leaching into the water table only 1 metre below it. A test was conducted to determine if a problem existed. Using a Dutch auger, 5 test holes around the lagoon, approximatley 2.5 metres deep, were dug into the water bearing layers. Excavated soils were analyzed by hand texturing. After bailing each hole and allowing the accumulated water to settle for 15 hours, water samples were taken to determine nitrates/nitrites levels.

Excavated soils were comprised of a silty clay. The water bearing layer below the clay was about 30 to 40 centimetres thick and consisted of a sandy silt texture. All water samples were then sent to a lab to be analyzed.

It is assumed that nitrate/nitrites are the most significant indicators of leaching. According to the results from the nitrate/nitrite test, it would appear that leachate did not pass through the clay beneath the lagoon into the water bearing layer to any significant degree. Canadian Drinking Water Standards allow up to 10 mg/litre of nitrate/nitrite. The highest level recorded from any of the samples was 0.6 mg/litre.



Meat Processing Facilities in Alberta



Keeping Alberta in a competitive postion in the market place requires competing at today's world standards. ***Meat Processing Facilities in Alberta*** is a manual of practice aimed at Alberta meat processors to help meet or exceed these demanding requirements. Over 120 pages outlining the regulations and technology needed for safe, efficient abattoirs and meat processing facilities - a must for all processors, suppliers, contractors, consultants and government agencies. This manual provides a systematic approach to food safety, environmental guidelines, animal well-being and occupational health and safety.

Providing an orderly and user-friendly approach to:

- ✓ Regulations, Codes and Permits
- ✓ General Principles of Food Hygiene
- ✓ Environmental Guidelines
- ✓ Background Technology
- ✓ Plant Layout
- ✓ Design and Construction

Meat Processing Facilities in Alberta

For orders placed within Alberta, mail to:
The Alberta Meat Processors Association
#13, 21215 Wye Road
Sherwood Park, Alberta T8G 1C8
(Payable to the Alberta Meat Processors Association)

For orders placed outside Alberta, mail to:
Engineering Services Branch
Alberta Agriculture, Food and Rural Development
Room 201, 7000 - 113 Street
Edmonton, Alberta T6H 5T6
(Payable to the Provincial Treasurer)

Name: _____ Order: _____ Manual(s) @ $50 Cdn _____
(includes shipping and handling)

Address: _____ Add 7% GST _____

Town: _____ Province (State): _____ **Total** _____

Postal (Zip) Code: _____

Include payment with order.

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